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| --- | --- |
| CHANGE REQUEST | |
| Meeting ID:\* | ARC #37.2 |
| Source:\* | Catalina Mladin, Convida Wireless, [Mladin.Catalina@ConvidaWireless.com](mailto:Mladin.Catalina@ConvidaWireless.com) |
| Date:\* | 2018-10-12 |
| Reason for Change/s:\* | See Introduction |
| CR against: Release\* | Rel-3 |
| CR against: WI\* | Active  MNT maintenance  Is this a companion CR? Yes  No  Companion CR number: (Note to Rapporteur - use latest agreed revision)Is this a mirror CR? Yes  No  Mirror CR number: (Note to Rapporteur - use latest agreed revision)  STE Small Technical Enhancements / < Work Item number (optional)>  Only ONE of the above shall be ticked |
| CR against: TS/TR\* | WI-0049 – Maintenance |
| Clauses \* | TS-0001 v3.11.0 |
| Type of change: \* | Editorial change  Bug Fix or Correction  Change to existing feature or functionality  New feature or functionality  Only ONE of the above shall be ticked |
| Impacted other TS/TR(s) | Clean-up for Rel-3 Publication |
| Post Freeze checking:\* | This CR contains only essential changes and corrections? YES  NO  This CR may break backwards compatibility with the last approved version of the TS? YES  NO |
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GUIDELINES for Change Requests:

Provide an informative introduction containing the problem(s) being solved, and a summary list of proposals.

Each CR should contain changes related to only one particular issue/problem.

In case of a correction, and the change apply to previous releases, a separate “mirror CR” should be posted at the same time of this CR

Mirror CR: applies only when the text, including clause numbering are exactly the same.

Companion CR: applies when the change means the same but the baselines differ in some way (e.g. clause number).

Follow the principle of completeness, where all changes related to the issue or problem within a deliverable are simultaneously proposed to be made E.g. A change impacting 5 tables should not only include a proposal to change only 3 tables. Includes any changes to references, definitions, and acronyms in the same deliverable.

Follow the drafting rules.

All pictures must be editable.

Check spelling and grammar to the extent practicable.

Use Change bars for modifications.

The change should include the current and surrounding clauses to clearly show where a change is located and to provide technical context of the proposed change. Additions of complete clauses need not show surrounding clauses as long as the proposed clause number clearly shows where the new clause is proposed to be located.

Multiple changes in a single CR shall be clearly separated by horizontal lines with embedded text such as, start of change 1, end of change 1, start of new clause, end of new clause.

When subsequent changes are made to content of a CR, then the accepted version should not show changes over changes. The accepted version of the CR should only show changes relative to the baseline approved text.

## Introduction

This contribution seeks to address the editor’s notes adding intro text for DM and node management, and to clarify statements in DM sections which are in scope of Release 3. The contribution also seeks to clarify and re-organize the DM section, because the original made some of the statements general, when in fact they were applicable only to non-native DM

Note that deletion of the “DM resource lifecycle” clause is proposed because the text has been moved to 6.2.4.1. The intent here is to bring to 6.2.4.1.0 high-level statements that apply to both native and non-native DM. Afterwards, 6.2.4.1.1 treats only issues related to non-native DM because the architecture and the interractions covered here are not needed for native DM. As with other topics additional details for DM are provided in section 10.2.8, so some of the detail has been moved there.

In addition, several questions are posed initially via comments and are subject to offline agreements (so reviewers please respond with your comments):

-Deleted part of the note in 10.2.8.3 about <node> being created when node not available – otherwise it needs clarifications

-Cleaned-up 10.2.8.7 statement about co-located entities

- Change 3 for <schedule>: introduces own ACPs was discussed at ARC#37, which seems in scope of release 3 corrections

NOTE for Rapporteur: a number of editorials have also been done (extra spaces deleted, grammar correction in text otherwise unchanged

R01 contains additional changes based on offline comments and agreements

### ---------------------------------- Start of Change 1-------------------------------------------

6.2.4 Device Management

6.2.4.1 General Concepts

6.2.4.1.0 Overview

The Device Management (DMG) CSF provides management of device capabilities on MNs (e.g. M2M Gateways), ASNs and ADNs (e.g. M2M Devices), as well as devices that reside within an M2M Area Network. Application Entities (AE) can manage the device capabilities on those Nodes by using the services provided by the DMG CSF alleviating the need for the AE to have knowledge of the technology specific protocols or data models. While the AE does not require an understanding of the technology specific protocols or data models, this information is provided to the AE so that an AE can utilize this information for administrative purposes (e.g. diagnostics, troubleshooting).

In order to manage the CSE and device capabilities of the MNs, ASNs and ADNs, the DMG can utilize existing technology specific protocols (e.g. BBF TR‑069 [i.2], OMA-DM [i.3], and LWM2M [i.4]) in addition to resource operations across the Mcc and Mca reference points.

When non-oneM2M protocols are used to manage oneM2M Nodes the DMG of an IN or MN translates or adapts the management related oneM2M requests to/from the corresponding technology via a Management Adapter. The existing technology then supports operations between Management Servers and Management Clients. Architectural details regarding the use of non-oneM2M technology protocols is provided in clause 6.2.4.1.1.

The architectural model for the native Device Management uses the generic oneM2M architecture and refernce points.

Both Device Management options (native oneM2M or non-oneM2M) use resources maintaining information and relationships that are specific to Device Management (i.e. Device Management Resources), as well as general purpose resources.

Device Management Resources maintain information and relationships used to:

* Manage technology specific data model objects via a Management Server which requires the information necessary to identify and access the Management Server.
* Invoke the security mechanism of the Management Server in order to authorize access to the technology specific data model objects.

Procedures for managing Device Management Resources are further detailed in clause 10.2.8 and apply to both Device Management options. For Device Management using external technologies, at most one Management Server is able to Create, Delete or Update addressable elements of a Management Resource.

6.2.4.1.1 Device Management using other existing technologies

###### 6.2.4.1.1.1 Architecture

When non-oneM2M technologies are used to manage devices oneM2M resource operations need to be adapted to the specific protocol used (e.g. BBF TR‑069 [i.2], OMA-DM [i.3], and LWM2M [i.4]). In order to perform the translation and adaptation functions, the DMG has a functional component termed the Management Adapter (figure 6.2.4.1.1-1). The Management Adapter in the DMG of the management server hosting M2M Node (e.g. IN-DMG-MA) performs the adaptation between the DMG and Management Servers using the **ms** interface; while the Management Adapter in the DMG of the management client hosting M2M Node (e.g. MN-DMG-MA or ASN-DMG-MA) performs translation and adaptation between the DMG and the Management Client using the **la** interface. Only one Management Adapter is shown in the DMG although it can interact with Management Server using different technology specific protocols.

The interface between Management Server and Management Client (figure 6.2.4.1.1-1) is the **mc** interface which is subject to the technology specific protocol that is used (e.g. BBF TR-069 [i.2] or LWM2M [i.4]). The **mc** interface is technology dependent and is outside the scope of the present document.

The DMG in the MNs or ASNs can be used to manage devices in the M2M Area Network. In this case, the DMG is deployed with proxy functionality that interacts with the Proxy Management Client using the **mp** interface. The **mp** interface is technology dependent and is outside the scope of the present document.

The Management Server and Management Client can be implemented as an entity external to the Node or they can be implemented as an entity embedded within the Node (figure 6.2.4.1.1-1). The Management Server and the Management Client are located on the boundary of the Node to indicate this situation as well as to depict that an IN can utilize multiple Management Servers from various M2M and Network Service Providers.



**Figure 6.2.4.1.1-1: Device Management Architecture**

###### 6.2.4.1.1.2 Management Server Interaction

The DMG CSF in the IN has the capability to utilize Management Servers from technology specific protocols (e.g. BBF TR‑069 [i.2], OMA DM [i.3], LWM2M [i.4]) to implement the Device Management functions. The Management Adapter in the DMG of the management server hosting M2M Node (e.g. IN‑DMG‑MA) communicates with the Management Server using the **ms** interface of the Management Server. Note that **ms** interface is outside the scope of the present document. The IN-DMG-MA takes the following roles:

Protocol Translation between DMG and the Management Server:

After the DMG receives the requests from the request Originator, the Management Adapter in the DMG of the management server hosting M2M Node (e.g. IN-DMG-MA) translates the requests from the request Originator to requests with associated identifiers that can be understood by the Management Server. Likewise, the Management Adapter in the DMG of the management server Host (e.g. IN-DMG-MA) translates events from the Management Server and delivers the events to M2M Entities (e.g. AE, CSE) that are subscribed to the event. When the Management Server is embedded within the DMG, the Management Adapter translates the request and accepts events in the protocol understood by the Management Client.

Interaction with the Management Server:

By using **ms** interface, the Management Adapter in the DMG of the management server hosting M2M Node (e.g. IN-DMG-MA) can communicate with the Management Server. This is for delivering the requests from the request Originator to the Management Server, or receiving information from the Management Server that will be notified to subscribing M2M Entities (e.g. AE, CSE). The communication between the Management Adapter and the Management Server requires an establishment of a session which provides security dimensions for Access Control, Authentication, Non-repudiation, Data confidentiality, Communication security, Data integrity and Privacy. The Management Adapter in the DMG of the management server Host (e.g. IN-DMG-MA) can utilize a policy that defines when a session with the Management Server is established and torn down.

Management Server selection:

When the Management Adapter in the DMG of the management server hosting M2M Node (e.g. IN-DMG-MA) communicates with multiple Management Servers that have different level of access control privileges to resources from the Management Server, the Management Adapter selects the proper Management Server that has the access control privileges to perform the management requests. The access control policy information for resources from Management Servers may be discovered using the **ms** interface.

Discovery of technology specific data model objects:

When the Management Adapter in the DMG of the management server Host (e.g. IN-DMG-MA) maintains information (i.e. metadata, values) of the technology specific data model objects managed by a Management Server using the **ms** interface, the Management Adapter will be capable of discovering and keep up to date the technology specific data model object's information that are managed by the DMG and a Management Server.

A Management Server can be located in the Underlying Network using the Mcn reference point as depicted in figure 6.2.4.1.2.1-1 or the Management Server can be located in the M2M Service Layer as depicted in figure 6.2.4.1.2.1-2.



**Figure 6.2.4.1.2.1-1: Management Server in Underlying Network**



**Figure 6.2.4.1.2.1-2: Management Server in M2M Service Layer**

The **ms** interface is functionally the same interface regardless if the Management Server resides in the Underlying Network or the Service Layer. However, the access control privileges that the Management Server has for resources from the technology specific protocol can be different depending whether the Management Server resides in the Underlying Network or in the Services Layer. For example, in figure 6.2.4.1.2.1-1, the Management Server in the Underlying Network controls access of the exposed resources from the technology specific protocol, while, in the figure 6.2.4.1.2.1-2, the Management Server in the M2M Service Layer controls access to the resources.

###### 6.2.4.1.1.3 Management Server - Access Permissions

When an operation on an M2M Service Layer Resource is performed and if the access to the Resource is granted and the operation for the Resource utilizes a Management Server external to the service layer, the DMG CSF of the management server Host selects one or more among the authenticated Management Servers necessary to access the requested resources. The procedure for the selection of Management Servers is implementation specific and outside the scope of the present document.

The DMG CSF management functions that cause impacts to the Underlying Network utilize access permissions that are delegated from the provider of the network service layer.

###### 6.2.4.1.1.4 Management Server - External management object discovery

The Management Adapter of the Management Server Host (e.g. IN-DMG-MA) discovers information of the technology specific data model objects managed by a Management Server using the **ms** interface. The discovery of this information includes the:

M2M devices, devices in the M2M Area Network and M2M Applications to which the Management Server has access.

The metadata associated with the technology specific data model objects associated the M2M devices, devices in the M2M Area Network and M2M Applications. This metadata includes items such as the supported data/object model.

The Management Adapter of the Management Server Host (e.g. IN-DMG-MA) is capable of being kept up-to-date of the changes in the M2M Devices, devices in the M2M Area Network and M2M Applications or the metadata of the technology specific data model objects associated with those entities. In addition, the Management Adapter of the Management Server Host can maintain the value associated technology specific data model objects, associated the M2M devices, devices in the M2M Network and M2M Applications.

###### 6.2.4.1.1.5 Management Client Interaction

The DMG CSF in the Management Client Host (e.g. MN or ASN) can use the Management Client from existing management technologies (e.g. BBF TR‑069 [i.2], OMA DM [i.3], LWM2M [i.4]) to implement the Device Management functions. The Management Adapter in the Management Client Host (e.g. MN-DMG-MA, ASN-DMG-MA) communicates with the Management Client using the **la** interface (e.g. DM-7, 8, 9 ClientAPI in OMA DM [i.3]) that is provided by the Management Client. Note that the **la** interface is outside the scope of the present document. The Management Adapter in the Management Client Host takes the following roles:

Interaction with the Management Client:

By using **la** interface, the Management Adapter can communicate with the Management Client to discover the technology specific data model objects supported by the Management Client.

Mapping between the DMG and Management Client:

After the Management Adapter discovers the technology specific data model objects supported by the Management Client; the Management Adapter performs the mapping between the technology specific data model objects to resources. The DMG in the Management Client Host can create those resources in the Management Server hosting CSE, and the resources can be used by the device management AE to manage the device capabilities pertaining to the managed node.



**Figure 6.2.4.1.3.1-1: Management Client Interaction using "Ia" interface**

6

6.2.4.2 Detailed Descriptions

6.2.4.2.0 Overview

The DMG CSF provides capabilities for the purpose of managing M2M Devices/Gateways as well as devices in M2M Area Networks.



**Figure 6.2.4.2.0-1: Device Management Entities and Functions**

Such capabilities include:

Device Configuration Function (DCF): This function includes the configuration of the capabilities of the M2M Device, M2M Gateway or device in the M2M Area Network.

Device Diagnostics and Monitoring Function (DDMF): This function includes the troubleshooting through the use of diagnostic tests and retrieval of operational status and statistics associated with the M2M Device, M2M Gateway or device in the M2M Area Network.

Device Firmware Management Function (DFMF): This function provides the software lifecycle management for firmware components and associated artefacts for the M2M Device, M2M Gateway or device in the M2M Area Network.

Device Topology Management Function (DTMF): This function provides the management of the topology of the M2M Area Network. An M2M Area Network is comprised of ADNs and other devices in the M2M Area Network.

6.2.4.2.1 Device Configuration Function

The Device Configuration Function (DCF) provides the configuration of device capabilities that are necessary to support M2M Services and AEs in M2M Devices, M2M Gateways or devices in an M2M Area Network.

These device configuration capabilities include:

Discovery of a device's management objects and attributes.

Ability to enable or disable a device capability.

Provisioning configuration parameters of a device.

6.2.4.2.2 Device Diagnostics and Monitoring Function

The Device Diagnostics and Monitoring Function (DDMF) permits the troubleshooting of device capabilities that are necessary to support M2M Services and AEs in M2M Devices, M2M Gateways or devices in an M2M Area Network.

These device diagnostic and monitoring capabilities include:

Configuration of diagnostics and monitoring parameters on the device.

Retrieval of device information that identifies a device and its model and manufacturer.

Retrieval of device information for the software and firmware installed on the device.

Retrieval of information related to a battery within the device.

Retrieval of information associated with the memory in use by a device.

Retrieval of the event logs from a device.

Device reboot diagnostic operation.

Device factory reset diagnostic operation.

6.2.4.2.3 Device Firmware Management Function

The Device Firmware Management Function (DFMF) provides lifecycle management for firmware associated with a device.

Device firmware is comprised of firmware modules and artefacts (e.g. configuration files) that are maintained on a device. A device can maintain more than one firmware image and the capability to manage individual firmware images. The firmware lifecycle includes actions to download, update or remove a firmware image. In addition, firmware could be downloaded and updated within the same action.

6.2.4.2.4 Device Topology Management Function

The Device Topology Management Function (DTMF) is a function that is specific to M2M Gateways where an M2M Gateway maintains zero or more M2M Area Networks.

These device topology management capabilities include:

Configuration of the topology of the M2M Area Network.

Retrieval of information related to the devices attached to the M2M Area Network.

Retrieval of information that describes the transport protocol associated with the M2M Area Network.

Retrieval of information that describes the characteristics associated with online/offline status of devices in the M2M Area Network.

### ---------------------------------- End of Change 1-------------------------------------------

### ---------------------------------- Start of Change 2-------------------------------------------

### 10.2.8 Device management

#### 10.2.8.1 Introduction

This clause describes the procedures for managing device capabilities on MNs (e.g. M2M Gateways), ASNs and ADNs (e.g. M2M Devices), as well as devices that reside within an M2M Area Network.

Resources maintaining information and relationships that are specific to Device Management are termed Device Management Resources. This clause details the creation, retrieval, update and deletion of the information associated with the following Device Management Resources: <node>, <mgmtObj>, <mgmtCmd> and its child resource <execInstance>.

These operations are used in both Device Management options available in oneM2M: one utilizing existing technology protocols (e.g. BBF TR 069 [i.2], OMA-DM [i.3], and LWM2M [i.4]) and another utilizing the native oneM2M protocols. Clause 6.2.4 details the Device Management (DMG) CSF supporting this functionality.

10.2.8.2 Node management

This clause describes node management procedures over Mca and Mcc reference points, using the *<node>* resource which represents information about M2M Nodes that can be utilized in Device Management and other operations.

M2M Nodes represented by the <node> resource are: MN-CSE, ASN-CSE, ADN and NoDN. Zero, one or more <*node*> resources may be used to represent each M2M Node, as follows.

* A <*node*> resource representing a MN-CSE or a ASN-CSE is hosted by the represented CSE or the registrar CSE. The *hostedCSELink* attribute of the resource allows to find the <CSEBase> or <remoteCSE> resource representing the MN-CSE or ASN-CSE represented by the <node> resource. All *<node>* resources hosted on M2M Node's CSE may be announced to associated IN-CSEs.
* A <*node*> resource representing an ADN is hosted by the registrar CSE. The *hostedAELink* attribute of the resource allows to find the <AE> resources representing the AEs residing on the node ADN.
* A <*node*> resource representing a NoDN is hosted by a CSE with DMG capabilities used to perform Device Management operations on the NoDN. If the NoDN is an interworked device, the *hostedServiceLink* attribute of the resource allows to find the <*flexContainer*> resources representing the services hosted on the NoDN.

An entity co-located with a CSE on an ASN or MN which is managed using oneM2M Device Management shall be represented by the same <*node*> resource

10.2.8.3 Create *<node>*

This procedure shall be used for creating a *<node>* resource.

NOTE: The creation of the *<node>* resource is on discretion of the Originator.

**Table 10.2.8.3-1: *<node>* CREATE**

| ***<node>* CREATE** | |
| --- | --- |
| Associated Reference Point | Mca, Mcc and Mcc' |
| Information in Request message | All parameters defined in table 8.1.2-3 apply with the specific details for:  ***Content:*** The representation of the <node> resource described in clause 9.6.18  The following attributes from clause 9.6.18 are mandatory for the request:  *resourceType* which shall be set to the appropriate tag that identify the *<node>* resource as defined in clause 9.6.1.3  (see note) |
| Processing at Originator before sending Request | According to clause 10.1.2 |
| Processing at Receiver | According to clause 10.1.2 |
| Information in Response message | All parameters defined in table 8.1.3-1 apply with the specific details for:  ***Content*:** Address of the created *<node>* resource, according to clause 10.1.2 |
| Processing at Originator after receiving Response | According to clause 10.1.2 |
| Exceptions | According to clause 10.1.2 |
|  | |

10.2.8.4 Retrieve *<node>*

This procedure shall be used for retrieving the attributes of a *<node>* resource.

**Table 10.2.8.4-1: *<node>* RETRIEVE**

|  |  |
| --- | --- |
| ***<node>* RETRIEVE** | |
| Associated Reference Point | Mca, Mcc and Mcc' |
| Information in Request message | All parameters defined in table 8.1.2-3 apply with the specific details for:  ***Content*:** Void |
| Processing at Originator before sending Request | According to clause 10.1.3 |
| Processing at Receiver | According to clause 10.1.3 |
| Information in Response message | All parameters defined in table 8.1.3-1 apply with the specific details for:  ***Content*:** Attributes of the *<node>* resource as defined in clause 9.6.18 |
| Processing at Originator after receiving Response | According to clause 10.1.3 |
| Exceptions | According to clause 10.1.3 |

10.2.8.5 Update *<node>*

This procedure shall be used for updating the attributes and the actual data of a *<node>* resource and its child resources.

**Table 10.2.8.5-1: *<node>* UPDATE**

| ***<node>* UPDATE** | |
| --- | --- |
| Associated Reference Point | Mca, Mcc and Mcc' |
| Information in Request message | All parameters defined in table 8.1.2-3 apply with the specific details for:  ***Content***: attributes of the *<node>* resource as defined in clause 9.6.18 which need be updated, with the exception of the Read Only (RO) attributes cannot be modified |
| Processing at Originator before sending Request | According to clause 10.1.4 |
| Processing at Receiver | According to clause 10.1.4 with the following:  The Receiver shall check whether the provided attributes of the <node> resource represent a valid request for updating *<node>* resource |
| Information in Response message | According to clause 10.1.4 |
| Processing at Originator after receiving Response | According to clause 10.1.4 |
| Exceptions | According to clause 10.1.4 |

10.2.8.6 Delete *<node>*

This procedure shall be used for deleting an existing *<node>* resource.

**Table 10.2.8.6-1: *<node>* DELETE**

| ***<node>* DELETE** | |
| --- | --- |
| Associated Reference Point | Mca, Mcc and Mcc' |
| Information in Request message | All parameters defined in table 8.1.2-3 apply |
| Processing at Originator before sending Request | According to clause 10.1.5 |
| Processing at Receiver | According to clause 10.1.5 |
| Information in Response message | According to clause 10.1.5 |
| Processing at Originator after receiving Response | According to clause 10.1.5 |
| Exceptions | According to clause 10.1.5 |

10.2.8.7 Device management using *<mgmtObj>*

This clause describes the management procedures over Mca and Mcc reference points.

If technology specific protocols are used for management, different operations addressing a *<mgmtObj>* resource (or its attributes or child resources) shall be translated by IN-CSE or MN-CSE into technology specific requests performed on the mapped technology specific data model object on the managed entity. In this case, the <mgmtObj> resources are hosted on the IN-CSE or MN-CSE. Although management requests by the AE are agnostic to the technology specific protocol, the *<mgmtObj>* resource exposes information about the technology specific protocol. AEs have the capability to retrieve this information within the *objectIDs* attribute of the *<mgmtObj>* resource.

In the scenario where the *<mgmtObj>* resource does not utilize an external management technology but instead uses the M2M Service Layer to perform the management request, the *<mgmtObj>* resource is hosted on the CSE of the managed entity when the managed entity is an ASN, MN or IN.

If the managed entity is an ADN node or the managed entity is co-located on an ASN, MN or IN, the <mgmtObj> resource is hosted on the registrar CSE of the managed entity. The *<mgmtObj>* resource and its parent *<node>*  resource hosted on node's CSE may be announced to associated IN-CSEs

In the scenario where the managed entity is an NoDN, the managed entities' *<mgmObj>* resources are hosted by a CSE with DMG capabilities used to perform Device Management operations on the NoDN.

10.2.8.8 Create *<mgmtObj>*

This procedure shall be used to create a specific *<mgmtObj>* resource in the Hosting CSE to expose the corresponding management function of a managed entity (i.e. M2M Device/Gateway) over the Mca reference point. Depending on the data model being used, the created *<mgmtObj>* resource may be a partial or complete mapping from the technology specific data model object on the managed entity. If such a technology specific data model object is missing from the managed entity, it shall be added to the managed entity. Further operations performed on the created *<mgmtObj>* resource shall be converted by the Hosting CSE into a corresponding technology specific request performed on the mapped technology specific data model object on the managed entity using technology specific protocol (e.g. OMA‑DM [i.3] or BBF TR-069 [i.2]).

Besides the generic create procedure defined in clause 10.1.2, the procedure in the following table shall be used when management is performed using technology specific protocols.

If the management is performed by service layer entities, the procedure is the same as generic create procedure defined in clause 10.1.2. In this case, local APIs (drivers) on the managed entity is required to monitor the change of the <mgmtObj> resource and reflect the change to the managed entity.

**Table 10.2.8.8-1: *<mgmtObj>* CREATE**

|  |  |
| --- | --- |
| ***<mgmtObj>* CREATE** | |
| Associated Reference Point | Mcc and Mca |
| Information in Request message | ***From:*** Identifier of the AE or the CSE that initiates the Request  ***To:*** The address of the *<node>* where the *<mgmtObj>* resource is intended to be Created  ***Content:*** The representation of the *<mgmtObj>* resource for which the attributes are described in clause 9.6.15 |
| Processing at Originator before sending Request | The Originator shall be an IN-AE, or a CSE which the managed entity is associated with:  The Originator is a CSE: In this case, the CSE first collects the original technology specific data model object (the management tree structure or also the value of the tree nodes if needed) of the local device and transforms the object into the *<mgmtObj>* resource representation, then requests the Hosting CSE to create the corresponding *<mgmtObj>* resource.  The Originator is an AE: In this case, the AE requests the Hosting CSE to add the corresponding technology specific data model object to the managed entity by creating an <mgmtObj> resource in the Hosting CSE  (See notes 1 and 2) |
| Processing at Receiver | For the CREATE operation, besides the common create operation defined in clause 10.1.2, the Receiver shall:  If the Originator is an AE: Check if there is existing management session between the management server and the managed entity. If not, request the management server to establish a management session towards the managed entity. Send the technology specific request to the managed entity or to the management server to add the corresponding technology specific data model object to the managed entity based on technology specific protocol  Maintain the mapping relationship between the created *<mgmtObj>* resource and the technology specific data model object on the managed entity  Respond to the Originator with the appropriate responses based on the technology specific response. It shall also provide in the response the address of the created new resource |
| Information in Response message | Error code if the new technology specific data model object is not created |
| Processing at Originator after receiving Response | None |
| Exceptions | The creation of the technology specific data model object is not allowed  The created technology specific data model object already exists  Corresponding technology specific data model object cannot be added to the managed entity for some reason (e.g. not reachable, memory shortage) |
| NOTE 1: The IN-CSE can create the *<mgmtObj>* resource locally by itself. The details are out of scope. In this case, the Hosting CSE first collects the original technology specific data model object on the managed entity via technology specific protocol (e.g. OMA DM [i.3], BBF TR-069 [i.2] or LWM2M [i.4]), then transforms the object into the *<mgmtObj>* resource representation and create the *<mgmtObj>* resource locally in the IN-CSE.  NOTE 2: The *<mgmtObj>* resource can be created in the Hosting CSE by other offline provisioning means which are out of scope. | |

10.2.8.9 Retrieve *<mgmtObj>*

This procedure shall be used to retrieve information from an existing *<mgmtObj>* resource. Besides the generic retrieve procedure defined in clause 10.1.3, the procedure in the following table shall be used when management is performed using technology specific protocols. If the management is performed by service layer entities, the procedure is the same as generic retrieve procedure defined in 10.1.3.

**Table 10.2.8.9-1: *<mgmtObj>* RETRIEVE**

|  |  |
| --- | --- |
| ***<mgmtObj>* RETRIEVE** | |
| Associated Reference Point | Mcc and Mca |
| Information in Request message | ***From:*** Identifier of the AE or the CSE that initiates the Request  ***To:*** The address of the *<mgmtObj>* resource |
| Processing at Originator before sending Request | The Originator shall be an AE, or a CSE which the managed entity is associated with |
| Processing at Receiver | For the RETRIEVE operation, besides the common retrieve operation defined in clause 10.1.3, the Receiver shall:  If the Originator is an AE and if the requested information of the *<mgmtObj>* resource is not available, identify the corresponding technology specific data object on the managed entity according to the mapping relationship that the IN‑CSE maintains. Check if there is an existing management session between the management server and the managed entity. If not, request the management server to establish a management session towards the managed entity. Send the technology specific request to get the corresponding technology specific data model object from the managed entity based on the external management technology, then return the result to the Originator based on the technology specific response |
| Information in Response message | Error code if the new technology specific data model object cannot be retrieved |
| Processing at Originator after receiving Response | None |
| Exceptions | Corresponding technology specific data model object data cannot be retrieved from the managed entity (e.g. technology specific data model object not found) |

10.2.8.10 Update *<mgmtObj>*

This procedure shall be used to update information of an existing *<mgmtObj>* resource. Besides the generic update procedure defined in clause 10.1.4, the procedure in the following table shall be used when management is performed using technology specific protocol. If the management is performed by service layer entities, the procedure is the same as generic update procedure defined in clause 10.1.4. In this case, local APIs (drivers) on the managed entity is required to monitor the change of the <mgmtObj> resource and reflect the change to the managed entity.

**Table 10.2.8.10-1: *<mgmtObj>* UPDATE**

|  |  |
| --- | --- |
| ***<mgmtObj>* UPDATE** | |
| Associated Reference Point | Mcc and Mca |
| Information in Request message | ***From:*** Identifier of the AE or the CSE that initiates the Request  ***To:*** The address of the *<mgmtObj>* resource  ***Content:*** The representation of the *<mgmtObj>* resource for which the attributes are described in clause 9.6.15 |
| Processing at Originator before sending Request | The Originator shall be an IN-AE, or a CSE which the on a managed entity is associated with |
| Processing at Receiver | For the UPDATE operation, besides the common update operation defined in clause 10.1.4, the Receiver shall:  If the Originator is an IN-AE, identify the corresponding technology specific data model object on the managed entity according to the mapping relationship it maintains. Check if there is an existing management session between the management server and the managed entity. If not, request the management server to establish a management session towards the managed entity. Send the technology specific request to update the corresponding technology specific data model object in the managed entity accordingly based on technology specific protocol  Respond to the Originator with the appropriate response based on the technology specific response from the external management technology |
| Information in Response message | Error code if the technology specific data model object cannot be updated |
| Processing at Originator after receiving Response | None |
| Exceptions | Corresponding technology specific data model object cannot be updated to managed entity (e.g. not reachable, technology specific data model object not found) |

10.2.8.11 Delete *<mgmtObj>*

This procedure shall be used to delete an existing *<mgmtObj>* resource. An Originator uses this procedure to remove the corresponding technology specific data model object (e.g. an obsolete software package) from the managed entity. Besides the generic delete procedure defined in clause 10.1.5, the procedure in the following table shall be used when management is performed using external management technologies. If the management is performed by service layer entities, the procedure is the same as generic delete procedure defined in clause 10.1.5. In this case, local APIs (drivers) on the managed entity is required to monitor the change of the <mgmtObj> resource and reflect the change to the managed entity.

**Table 10.2.8.11-1: *<mgmtObj>* DELETE**

|  |  |
| --- | --- |
| ***<mgmtObj>* DELETE** | |
| Associated Reference Point | Mcc and Mca |
| Information in Request message | ***From:*** Identifier of the IN-AE, or the CSE that initiates the Request  ***To:*** The address of the *<mgmtObj>* resource |
| Processing at Originator before sending Request | The Originator shall be an IN-AE or CSE which the managed entity is associated with:  The Originator is a CSE: In this case, the CSE issues the request to the Hosting CSE to hide the corresponding management function from being exposed by the *<mgmtObj>* resource  The Originator is an IN-AE: In this case, the IN-AE requests the Hosting CSE to delete the *<mgmtObj>* resource from the Hosting CSE and to remove the corresponding technology specific data model object from the managed entity  (See notes 1 and 2) |
| Processing at Receiver | For the DELETE operation, besides the common create operation defined in clause 10.1.5, the Receiver shall:  If the Originator is an IN-AE, identify the corresponding technology specific data model object on the managed entity according to the mapping relationship IN-CSE maintains. Check if there is an existing management session between the management server and the managed entity. If not, request the management server to establish a management session towards the managed entity. The IN-CSE sends technology specific request to remove the corresponding technology specific data model object from the managed entity based on technology specific protocol  Respond to the Originator with the appropriate generic responses based on the technology specific response |
| Information in Response message | Error code if the technology specific data model object cannot be deleted |
| Processing at Originator after receiving Response | None |
| Exceptions | Corresponding technology specific data model object cannot be deleted from managed entity (e.g. not reachable, technology specific data model object not found) |
| NOTE 1: The Hosting IN-CSE can delete the *<mgmtObj>* resource locally by itself. This internal procedure is out of scope.  NOTE 2: The *<mgmtObj>* resource can be deleted in the Hosting CSE by offline provisioning means which are out of scope. | |

10.2.8.12 Execute *<mgmtObj>*

This procedure shall be used to execute a technology specific requests on a managed entity through an existing *<mgmtObj>* resource on the Hosting CSE.

**Table 10.2.8.12-1: *<mgmtObj>* EXECUTE**

|  |  |
| --- | --- |
| ***<mgmtObj>* EXECUTE** | |
| Associated Reference Point | Mcc and Mca |
| Information in Request message | ***From:*** Identifier of the IN-AE, or the CSE that initiates the Request  ***To:*** The address of the *<mgmtObj>* resource |
| Processing at Originator before sending Request | The Originator shall be an IN-AE or a CSE which the managed entity is associated with. The Originator shall request to execute a management command which is represented by a *<mgmtObj>* resource or its attribute by using an UPDATE operation  The request shall address the executable *<mgmtObj>* resource. For an execute operation on an attribute(s), the ***Content*** parameter shall be included with the name of such attribute(s) with predefined value(s) to trigger the respective action  After the execution request, the Originator shall request to retrieve the execution result or status from the executable *<mgmtObj>* resource or its attribute/child resource by using a RETRIEVE operation as specified in clause 10.2.8.9 |
| Processing at Receiver | For the EXECUTE operation the Receiver shall:  Check if the Originator has the WRITE privilege on the addressed *<mgmtObj>* resource or its attribute  Check if there is an existing management session between the management server and the managed entity. If not, request the management server to establish a management session towards the managed entity. Send the technology specific request to execute the corresponding management command (e.g. "Exec" in OMA DM [i.3]) on the managed entity based on technology specific protocol  Respond to the Originator with the appropriate response based on the technology specific response. If available, the technology specific response shall contain execution results  Retrieve the execution result or status from the executable *<mgmtObj>* resource or its attribute, perform the procedures as described in clause 10.2.8.9  Upon receiving a management notification (e.g. OMA-DM [i.3] "Generic Alert" message or BBF TR-069 [i.2] "Inform" message) from a managed entity regarding the execution result or status, the Receiver shall send the technology specific request to retrieve the execution result or status of the technology specific data model object information received from the managed entity and update the corresponding *<mgmtObj>* resource or its attribute |
| Information in Response message | Error code if the technology specific request cannot be executed |
| Processing at Originator after receiving Response | None |
| Exceptions | Corresponding technology specific request cannot be executed in managed entity (e.g. not reachable, technology specific data model object not found) |

10.2.8.13 Device management using *<mgmtCmd>* and *<execInstance>*

This clause describes how RESTful management operations may be performed using *<mgmtCmd>* resources over the Mca and Mcc reference points. The *<mgmtCmd>* resource, together with its attributes or sub-resources, may be used in the process of translating between RESTful operations and management commands and procedures from existing management technologies (e.g. BBF TR-069 [i.2]). These procedures can then be performed on the managed entity, using the Management Adapter and the procedures described in the following clauses.

10.2.8.14 Create *<mgmtCmd>*

A CREATE request shall be used by an Originator to create a specific *<mgmtCmd>* resource in a Hosting CSE.

The created <mgmtCmd> resource will be mapping a RESTful method to management commands and/or procedures which may be translated from existing management protocols (e.g. BBF TR-069 [i.2]). At run-time the Hosting CSE can expose the translated commands, over the Mcc reference point, to the managed entities (i.e. ASN/MN-CSE).

The Originator may be:

An AE registered to the IN-CSE.

The CSE on the managed entity: In this case, the CSE transforms supported management command into the *<mgmtCmd>* resource representation, then requests the Hosting CSE to create the corresponding *<mgmtCmd>* resource.

NOTE 1: The Hosting IN-CSE in the network domain may also create the *<mgmtCmd>* resource locally by itself. The details are out of scope. Then an AE can discover the created *<mgmtCmd>* and manipulate it.

NOTE 2: The *<mgmtCmd>* resource could also be created in the Hosting CSE by other offline provisioning means which are out of scope.

The Receiver shall be an IN-CSE.

**Table 10.2.8.14-1: *<mgmtCmd>* CREATE**

| ***<mgmtCmd>* CREATE** | |
| --- | --- |
| Associated reference point | Mcc and Mca |
| Information in Request message | The attributes of the *<mgmtCmd>* resource. The mandatory and/or optional attributes defined in clause 9.6.16, as needed |
| Processing at Originator before sending Request | According to clause 10.1.2with the following:  The CSE on the originating node shall first collect local management command |
| Processing at the Receiver | According to clause 10.1.2 with the following:  The Receiver CSE shall maintain the mapping between the created *<mgmtCmd>* resource and the corresponding nonRESTful commands represented by the *cmdType* attribute of *<mgmtCmd>* resource |
| Information in Response message | According to clause 10.1.2 with the following specific information:  ***Content:*** Address of created *<mgmtCmd>* resource |
| Processing at Originator after receiving Response | According to clause 10.1.2 |
| Exceptions | According to clause 10.1.2 |

10.2.8.15 Retrieve *<mgmtCmd>*

This procedure shall be used for retrieving all or part information from a previously created *<mgmtCmd>* resource on a target CSE.

The Originator may be:

An AE.

A CSE.

The Receiver shall be an IN-CSE.

**Table 10.2.8.15-1: *<mgmtCmd>* RETRIEVE**

| ***<mgmtCmd>* RETRIEVE** | |
| --- | --- |
| Associated reference point | Mcc and Mca |
| Information in Request message | According to clause 10.1.3, with the mandatory and/or optional attributes defined in clause 9.6.16, as needed |
| Processing at Originator before sending Request | According to clause 10.1.3 |
| Processing at Receiver | According to clause 10.1.3 |
| Information in Response message | According to clause 10.1.3 |
| Processing at Originator after receiving Response | According to clause 10.1.3 |
| Exceptions | According to clause 10.1.3 |

10.2.8.16 Update *<mgmtCmd>*

This procedure shall be used for updating some of the attributes (other than *execEnable*) of an existing *<mgmtCmd>* resource with new attribute values. An UPDATE method applied to the *execEnable* attribute is used to trigger the execution of the management procedure represented by <*mgmtCmd*>, as described in section 10.2.8.18.

The Originator may be:

An AE.

A CSE.

The Receiver shall be an IN-CSE.

**Table 10.2.8.16-1: *<mgmtCmd>* UPDATE**

| ***<mgmtCmd>* UPDATE** | |
| --- | --- |
| Associated reference point | Mcc and Mca |
| Information in Request message | According to clause 10.1.4, including mandatory and/or optional attributes defined in clause 9.6.16, as needed |
| Processing at Originator before sending Request | According to clause 10.1.4 |
| Processing at Receiver | According to clause 10.1.4 |
| Information in Response message | According to clause 10.1.4 |
| Processing at the Originator after receiving Response | According to clause 10.1.4 |
| Exceptions | According to clause 10.1.4 |

10.2.8.17 Delete *<mgmtCmd>*

This procedure shall be used for deletion of an existing *<mgmtCmd>* resource on a Hosting CSE. An AE may also use this procedure to cancel any initiated *<execInstance>* of an *<mgmtCmd>* if applicable.

The Originator may be:

The CSE on the manageable entity: In this case, the CSE issues the request to the Hosting CSE to hide the corresponding management command from being exposed by the *<mgmtCmd>* resource.

An AE: In this case, the AE requests the Hosting CSE to delete the *<mgmtCmd>* resource from the Hosting CSE and cancel all initiated *<execInstance>* of an *<mgmtCmd>* if applicable.

NOTE 1: The Hosting CSE in the network domain could also delete an *<mgmtCmd>* resource locally by itself. This internal procedure is out of scope.

NOTE 2: The *<mgmtCmd>* resource could also be deleted in the Hosting CSE by other offline provisioning means which are out of scope.

If the Originator is an AE and there is any initiated *<execInstance>* under the *<mgmtCmd>* that can be cancelled by a corresponding management command. The Hosting CSE shall also issue the management command to the managed entity to cancel those initiated *<execInstance>* based on existing management protocol (i.e. BBF TR-069 [i.2]). Then the CSE shall respond to the Originator with the appropriate generic responses.

The Receiver shall be an IN-CSE.

**Table 10.2.8.17-1: *<mgmtCmd>* DELETE by ASN-CSE or MN-CSE**

| ***<mgmtCmd>* DELETE by ASN-CSE or MN-CSE** | |
| --- | --- |
| Associated reference point | Mcc |
| Information in Request message | According to clause 10.1.5 |
| Processing at Originator before sending Request | According to clause 10.1.5 with the following:  Before issuing a DELETE request to the IN-CSE, the originating CSE may perform cancelling of the corresponding management command locally |
| Processing at Receiver | According to clause 10.1.5 with the following:  The Receiver IN-CSE shall verify if there are any initiated *<execInstance>* commands under the *<mgmtCmd>* which are cancellable by using a corresponding management command. If there are, the Receiver IN-CSE shall issue the management command to the managed entity to cancel those initiated *<execInstance>* based on existing management protocol (i.e. BBF TR-069 [i.2])  The *<mgmtCmd>* resource shall be deleted from the repository of the Receiver IN-CSE  Then the Receiver IN-CSE shall respond to the Originator ASN-CSE or MN-CSE with the appropriate responses |
| Information in Response message | According to clause 10.1.5 |
| Processing at Originator after receiving Response | According to clause 10.1.5 |
| Exceptions | According to clause 10.1.5 with the following:  If the deletion is not allowed or the specific *<mgmtCmd>* resource does not exist, there is no local processing in the Receiver IN-CSE and a proper error code shall be returned to the Originator ASN-CSE or MN-CSE  If the corresponding initiated commands cannot be deleted from the managed entity due to some reason (e.g. not found) a response with the proper indication shall be returned to the Originator ASN-CSE or MN-CSE |

**Table 10.2.8.17-2: *<mgmtCmd>* DELETE by an AE**

| ***<mgmtCmd>* DELETE by an AE** | |
| --- | --- |
| Associated Reference Points | Mca |
| Information in Request message | According to clause 10.1.5 |
| Processing at the Originator before sending Request | According to clause 10.1.5 |
| Processing at Receiver | According to clause 10.1.5 with the following:  If there is any initiated *<execInstance>* under *<mgmtCmd>* and it is cancellable, the Receiver IN-CSE shall cancel those initiated *<execInstance>* from the managed entity using corresponding management procedures in existing management protocol (i.e. CancelTransfer RPC in BBF TR-069 [i.2])  The *<mgmtCmd>* resource shall be deleted from the repository of the Receiver IN-CSE |
| Information in Response message | According to clause 10.1.5 |
| Processing at Originator after receiving Response | According to clause 10.1.5 |
| Exceptions | According to clause 10.1.5 with the following:  If the deletion is not allowed or the specific *<mgmtCmd>* resource does not exist, there is no local processing in the Receiver IN-CSE and a proper error code shall be returned to the Originator AE  If the corresponding initiated commands cannot be deleted from managed entity due to some reason (e.g. not found) a response with the proper indication shall be returned to the Originator AE |

10.2.8.18 Execute *<mgmtCmd>*

The Execute procedure shall be used by an Originator in order to trigger execution of a specific management command on a managed entity, by employing an UPDATE method to the *execEnable* attribute of an existing *<mgmtCmd>* resource on the Hosting CSE.

The Originator shall be an AE.

The Receiver shall be an IN-CSE.

**Table 10.2.8.18-1: *<mgmtCmd>* EXECUTE**

| ***<mgmtCmd>* EXECUTE** | |
| --- | --- |
| Associated reference Points | Mca |
| Information in Request message | According to clause 10.1.4, with the following (see attributes defined in clause 9.6.16):  The UPDATE request shall address the *execEnable* attribute with a predefined value to trigger the EXECUTE action |
| Processing at the Originator before sending Request | According to clause 10.1.4, with the following:  After issuing the execution request, the Originator may request to retrieve the execution result or status from *<execInstance>* sub-resources of the *<mgmtCmd>*by using a RETRIEVE method as described in clause 10.2.8.20 |
| Processing at the Receiver | According to clause 10.1.4 with the following:  The Receiver shall check if the Originator has the UPDATE privilege on the addressed *<mgmtCmd>* resource. Upon successful validation, the Hosting CSE shall perform command conversion and mapping, and send the converted management command to execute with the provided arguments on the remote entity based on existing device management protocol (i.e. BBF TR 069 [i.2])  Then the Hosting CSE shall create for each target a corresponding *<execInstance>* resource under *<mgmtCmd>* and shall respond to the Originator with the appropriate generic responses. It shall also provide in the response the URL of the created *<execInstance>* resource  If the *execTarget* attribute of the addressed *<mgmtCmd>* addresses a group, the Hosting CSE shall create corresponding *<execInstance>* resources for each target in the group and provide the corresponding URLs in the response  Upon receiving from any remote entity, a management notification (i.e. BBF TR‑069 [i.2] "Inform" message) regarding the execution result or status, the Hosting CSE may update the corresponding *<execInstance>* sub-resource locally |
| Information in Response message | According to clause 10.1.4 |
| Processing at Originator after receiving Response | According to clause 10.1.4, with additional processing which is dependent on the type of the command and execution status. The following actions may occur in any order after the command execution is finished:  The managed entity may send responses including execution results to the Receiver CSE, who will store the execution results in corresponding *<execInstance>* resource  The Originator AE may use normal RETRIEVE procedure to retrieve the execution results or status of an *<execInstance>.* After receiving a RETRIEVE request from the Originator AE, the Receiver CSE can retrieve the execution status or results on the managed entity using existing management protocol  A response shall be returned to the Originator AE |
| Exceptions | If the execution is not allowed or the specified *<mgmtCmd>* resource does not exist, no further processing is required on the Receiver CSE, and a proper error code shall be returned to the Originator AE in the message response  If the corresponding management command cannot be executed on the managed entity, an error code shall be returned with the response to Originator AE |

10.2.8.19 Cancel *<execInstance>*

The Cancel procedure shall be used by an originating AE to disable/stop/cancel an initiated management command execution on the remote entity, through an UPDATE method to the *execDisable* attribute of an existing *<execInstance>* resource on the Hosting CSE.

The Originator shall be an AE.

The Receiver shall be an IN-CSE.

**Table 10.2.8.19-1: *<execInstance>* CANCEL**

| ***<execInstance>* CANCEL** | |
| --- | --- |
| Associated reference Points | Mca |
| Information in Request message | According to clause 10.1.4, with the following (see attributes defined in clause 9.6.17):  The UPDATE request shall address the *execDisable* attribute with a predefined value in order to trigger the CANCEL action |
| Processing at the Originator before sending Request | Originator needs to disable/stop/cancel an initiated management command execution on the managed entity using an *<execInstance>* sub-resource at the Receiver, by using an UPDATE operation  See also clause 10.1.4 |
| Processing at Receiver | The Receiver shall check if the Originator has the UPDATE privilege on the addressed *<execInstance>* resource  Then, the Receiver shall check if the management operation is initiated and cancellable. Upon successful validation, the Receiver IN-CSE shall perform command conversion and mapping, then use existing management protocol (i.e. BBF TR-069 [i.2]) to cancel the corresponding management command execution initiated on the managed entity  The Receiver IN-CSE shall respond to the Originator with the appropriate responses |
| Information in Response message | According to clause 10.1.4 |
| Processing at Originator after receiving Response | According to clause 10.1.4 |
| Exceptions | If the *<execInstance>* has not been initiated, is already complete or it is not cancellable, or the specified *<execInstance>* resource does not exist in the Receiver IN-CSE, the post processing on Receiver CSE shall be skipped and a proper error code shall be returned to Originator in the Response message |

10.2.8.20 Retrieve *<execInstance>*

This procedure shall be used for retrieving all or part information from an *<execInstance>* resource on a target CSE.

The Originator shall be an AE.

The Receiver shall be an IN-CSE.

**Table 10.2.8.20-1: *<execInstance>* RETRIEVE**

| ***<execInstance>* RETRIEVE** | |
| --- | --- |
| Associated Reference Points | Mca |
| Information in Request message | According to clause 10.1.3, with the mandatory and/or optional attributes defined in clause 9.6.17, as needed |
| Processing at the Originator before sending Request | Originator needs to create a resource |
| Processing at Receiver | According to clause 10.1.3, with the following:  If the retrieval is allowed, the Receiver IN-CSE can retrieve the execution status or results on the managed entity using existing management protocol (i.e. BBF TR-069 [i.2])  If the retrieval is allowed, the addressed attributes of the *<execInstance>* resource shall be retrieved from the repository of the Receiver IN-CSE |
| Information in Response message | According to clause 10.1.3 |
| Processing at Originator after receiving Response | According to clause 10.1.3 |
| Exceptions | If the retrieval is not allowed or the specific *<execInstance>* resource does not exist in the Receiver IN-CSE, there is no local processing on the Receiver CSE and a proper error code shall be returned to Originator AE in the Response Message |

10.2.8.21 Delete *<execInstance>*

The DELETE request procedure shall be used by an originating AE to delete an existing *<execInstance>* resource on a Receiver IN-CSE.

The Originator shall be an AE.

NOTE 1: The Receiver IN-CSE in the network domain could also delete an *<execInstance>* resource locally by itself. This internal procedure is out of scope.

NOTE 2: The *<execInstance>* resource could also be deleted in the Receiver IN-CSE by other offline provisioning means which are out of scope.

**Receiver:** The Receiver shall check if the Originator has the DELETE permission on the addressed *<execInstance>* resource. Upon successful validation, the Hosting CSE shall remove the resource from its repository. If a corresponding management command has been initiated and is pending finished on the managed entity and the management command is cancellable, the Hosting CSE shall use existing management protocols (i.e. BBF TR-069 [i.2] CancelTransfer RPC) to cancel the corresponding management currently initiated at the managed entity. Then the CSE shall respond to the Originator with the appropriate generic responses.

The Hosting CSE shall be an IN-CSE.

**Table 10.2.8.21-1: *<execInstance>* DELETE**

| ***<execInstance>* DELETE** | |
| --- | --- |
| Associated Reference Point | Mca |
| Information in Request message | According to clause 10.1.5 |
| Processing at the Originator before sending Request | According to clause 10.1.5 |
| Processing at Receiver | According to clause 10.1.5 with the following:  If the *<execInstance>* has not been initiated, is already complete or it is not cancellable, the *<execInstance>* resource shall be deleted from the repository of the IN-CSE  If the *<execInstance>* is pending and it is cancellable, the Receiver IN-CSE shall first cancel the *<execInstance>* from the managed entity using corresponding management procedures in existing management protocol (i.e. CancelTransfer RPC in BBF TR‑069 [i.2]). Afterwards, the *<execInstance>* resource shall be deleted from the repository of the Receiver IN-CSE  If the corresponding initiated commands cannot be successfully cancelled on the managed entity for some reason, the *<execInstance>* resource shall be still deleted  Then the Receiver IN-CSE shall respond to the Originator with the appropriate generic responses |
| Information in Response message | According to clause 10.1.5 |
| Processing at Originator after receiving Response | According to clause 10.1.5 |
| Exceptions | If the deletion is not allowed or the specific *<execInstance>* resource does not exist on the Receiver IN-CSE, there is no processing at the Receiver and a proper error code shall be returned to the Originator |

### ------------------------------- End of Change 2 -----------------------------------------------

### ------------------------------- Start of Change 3 -----------------------------------------------

### 9.6.9 Resource Type *schedule*

The *<schedule>* resource contains scheduling information. The usage of the *<schedule>* resource is slightly different depending on the associated resource type, as follows:

* A child *<schedule>* resource of the *<node>* resource shall indicate the time periods when the node can communicate via the Underlying Network. If multiple Underlying Networks are supported, for each there can be a maximum of one <schedule> resources. One <schedule> resource may be used for multiple Underlying Networks.

The *mgmtLink* attribute of the *<cmdhNwAccessRule>* child of a <node> resource shall link to a <schedule> resource, child of the same <node> resource.

Note: The node shall obey the communication schedule indicated for the Underlying Network. If the schedule information is modified, the node shall ensure that the change of schedule is detected e.g. via external DM, subscription/notification mechanisms, polling, etc.

* A child <*schedule*> resource of the <*CSEBase*> resource shall indicate the anticipated time periods when the CSE is available for processing.
* A child *<schedule>* resource of the *<subscription>* resource shall indicate the time periods when the notifications can be sent to the notification targets.

The <schedule> resource shall contain the child resource specified in table 9.6.9-1.

Table 9.6.9-1: Child resources of *<schedule>* resource

| Child Resources of *<schedule>* | Child Resource Type | Multiplicity | Description | *<scheduleAnnc>* Child Resource Types |
| --- | --- | --- | --- | --- |
| *[variable]* | *<subscription>* | 0..n | See clause 9.6.8 | None |
| *[variable]* | *<transaction>* | 0..n | See clause 9.6.48 | *<transaction>* |

The *<schedule>* resource shall contain the attributes specified in table 9.6.9-2.

Table 9.6.9-2: Attributes of *<schedule>* resource

| Attributes of  *<schedule>* | Multiplicity | RW/  RO/  WO | Description | *<scheduleAnnc>* Attributes |
| --- | --- | --- | --- | --- |
| *resourceType* | 1 | RO | See clause 9.6.1.3. | NA |
| *resourceID* | 1 | RO | See clause 9.6.1.3. | NA |
| *resourceName* | 1 | WO | See clause 9.6.1.3. | NA |
| *parentID* | 1 | RO | See clause 9.6.1.3. | NA |
| *expirationTime* | 1 | RW | See clause 9.6.1.3. | MA |
| *creationTime* | 1 | RO | See clause 9.6.1.3. | NA |
| *lastModifiedTime* | 1 | RO | See clause 9.6.1.3. | NA |
| *labels* | 0..1 (L) | RW | See clause 9.6.1.3. | MA |
| *announceTo* | 0..1 (L) | RW | See clause 9.6.1.3. | NA |
| *announcedAttribute* | 0..1 (L) | RW | See clause 9.6.1.3. | NA |
| *accessControlPolicyIDs* | 0..1 (L) | RW | See clause 9.6.1.3 | NA |
| *dynamicAuthorizationConsultationIDs* | 0..1 (L) | RW | See clause 9.6.1.3. | NA |
| *scheduleElement* | 1 (L) | RW | Each item of the *scheduleElement* list shall be composed from seven fields of second, minute, hour, day of month, month, day of week and year. | OA |
| *networkCoordinated* | 0..1 | RW | Indicates if IN-CSE shall perform schedule coordination with an Underlying Network. This attribute is only applicable when <schedule> is a child resource of <node>. The supported values are:   * True: The IN-CSE shall perform schedule coordination. * False: The IN-CSE may not perform schedule coordination.   NOTE: The schedule coordination is also subject to IN-CSE local policy. | OA |

### ------------------------------- End of Change 3 -----------------------------------------------

CHECK LIST

* Does this Change Request include an informative introduction containing the problem(s) being solved, and a summary list of proposals.?
* Does this CR contain changes related to only one particular issue/problem?
* Have any mirror CRs been posted?
* Does this Change Request make **all** the changes necessary to address the issue or problem? E.g. A change impacting 5 tables should not include a proposal to change only 3 tables? Does this Change Request follow the drafting rules?
* Are all pictures editable?
* Have you checked the spelling and grammar?
* Have you used change bars for all modifications?
* Does the change include the current and surrounding clauses to clearly show where a change is located and to provide technical context of the proposed change? (Additions of complete clauses need not show surrounding clauses as long as the proposed clause number clearly shows where the new clause is proposed to be located.)
* Are multiple changes in this CR clearly separated by horizontal lines with embedded text such as, start of change 1, end of change 1, start of new clause, end of new clause.?